

### REMARKS

Claims 56-81 are pending in the present application. Claims 16-26, 29-39 and 42-55 were rejected under 35 U.S.C. § 112, second paragraph, as described on pages 3 and 4 of the Office action. Claims 1-3, 5, 7, 10-13, 16-18, 20, 22, 25, 26, 29, 30-33, 35, 38, 39, 42, 43, 45 and 47 were rejected under 35 U.S.C. § 102(b), as described on pages 4-7 of the Office action. Claims 4, 6, 9, 19, 21, 24, 32, 34, 37, 44, 46, 49, 50, 51, 52 and 53 were rejected under 35 U.S.C. § 103, as described on pages 7 and 8 of the Office action. Claims 8, 23, 36 and 48 were rejected under 35 U.S.C. § 103, as described on pages 8 and 9 of the Office action. Claims 14 and 15 were rejected under 35 U.S.C. § 103, as described on pages 9 and 10 of the Office action. Claims 54 and 55 were rejected under 35 U.S.C. § 103, as described on pages 10 and 11 of the Office action. Claims 56, 63, 68 and 75 are the only independent claims.

As claims 1-55 are canceled, it is respectfully submitted that the outstanding rejections are moot.

Newly added claims 56-81 are generally directed to aspects of the disclosure that were previously claimed, but have been drafted to comply with 35 U.S.C. § 112, second paragraph and to distinguish over the prior art of record.

Independent claim 56 is drawn to a device having a host layer comprising an undoped material capable of emitting light at a wavelength in the blue region. Independent claim 56 recites, *inter alia*, a hole transporting layer and:

**“a host layer comprising an undoped material capable of emitting light at a wavelength in the blue region, said host layer including at least one of a first portion having a red light emitting dopant material therein and a second portion having a green light emitting dopant material therein, said first portion being capable of emitting light at a wavelength in the red region, said second portion being capable of emitting light at a wavelength in the green region.” (Emphasis Added)**

Page 6 of the Office action asserts that Shirasaki “discloses a blue pigment within the universal host/HTL/ETL.” The Office action then further asserts that Shirasaki therefore, “discloses the universal host/HTL/ETL to be adapted to emit at wavelengths in the blue visible light region.” Irrespective of the accuracy of these assertions, Shirasaki fails to disclose a host layer comprising an

undoped material capable of emitting light at a wavelength in the blue region. As such, Shirasaki fails to disclose that which is recited in newly added independent claim 56.

Independent claim 63 is drawn to a device having a hole transporting layer comprising an undoped material capable of emitting light in the blue region. Independent claim 63 recites, *inter alia*:

**“a hole transporting layer comprising an undoped material capable of emitting light at a wavelength in the blue region, said hole transporting layer including at least one of a first portion having a red light emitting dopant material therein and a second portion having a green light emitting dopant material therein, said first portion being capable of emitting light at a wavelength in the red region, said second portion being capable of emitting light at a wavelength in the green region.” (Emphasis Added)**

For reasons similar to those discussed above with respect to claim 56, the prior art of record fails to disclose a hole transporting layer comprising an undoped material capable of emitting light at a wavelength in the blue region. Specifically, Shirasaki fails to disclose or suggest a hole transporting layer comprising an undoped material capable of emitting light at a wavelength in the blue region.

In one exemplary embodiment of the present invention, for example as discussed on page 5, lines 21-24 of the application, 4,4-bis(1-naphthylphenylamino)biphenyl (NPB) is used as a host material and a hole transport material that has blue emissive properties.

The Office action fails to specifically address modifying the hole transporting layer of Shirasaki to comprise a material that has blue emissive properties and that has a red light emitting dopant material therein and a green light emitting dopant material therein. However, page 9 of the Office action asserts that 4,4-bis(1-naphthylphenylamino)biphenyl (NPB) is disclosed in Lin. Lin discloses, in column 8, lines 10-12, a hole transporting layer comprised of 1,4-bis(1-naphthylphenylamino)biphenyl (NPD). Irrespective of the accuracy of the assertion in the Office action, it is submitted that one of ordinary skill in the art would not have been motivated to modify the device of Shirasaki to include the material disclosed in Lin to arrive at the invention recited in claim 63.

With respect to the subject matter recited in claim 8, page 9 of the Office action asserts that:

“[a]bsent of solving any long standing need or problem, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 4,4-bis(1naphthylphenylamino)biphenyl for the HTL of Shirasaki because the selection of one HTL material over another is considered to constitute an obvious design variation based on the availability and cost of the materials.

First of all, the phrase “absent of solving any long standing need or problem,” addresses rebuttable arguments reserved to the Applicant, in the event that the Office establishes a *prima facie* case of obviousness. It is submitted that the Office has failed to establish a *prima facie* case of obviousness with respect to the subject matter recited in canceled claim 8.

As explicitly discussed in MPEP § 2143, to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. In the present case, there is no suggestion or motivation in either Shirasaki or Lin to substitute 4,4-bis(1naphthylphenylamino)biphenyl for the HTL of Shirasaki. Further, there is no evidence in Shirasaki, Lin or any other portion of the record relating the “availability and cost of the materials.” Finally, there is no evidence in the record that “availability and cost of the materials” is generally available to one of ordinary skill in the art, or more importantly the such “availability and cost of the materials” would motivate one of skill in the art to make the proposed modification. Accordingly, there is absolutely no basis for the Examiner to conclude that selection of 4,4-bis(1naphthylphenylamino)biphenyl for the HTL of Shirasaki would be considered to constitute an obvious design variation.

In light of the above, it is clear that the Office action provides inappropriate motivation to modify Shirasaki in view of Lin. Therefore, the Office action fails to establish a *prima facie* case of obviousness with respect to the subject matter recited in canceled claim 8. For similar reasons, it is clear that newly added independent claim 63 is patentable over the combination of Shirasaki in view of Lin within the meaning of 35 U.S.C. § 103.

Independent claim 68 is drawn to a device having a host layer having a dopant material therein that enables energy transfer and direct carrier recombination. Independent claim 68 recites, *inter alia*, a host layer wherein:

“said **host layer comprises a material having a spectral overlap** with said at least one of said first portion having said red light emitting dopant material therein and said second portion having said green light emitting dopant material therein, **the spectral overlap enabling energy transfer and direct carrier recombination in said host layer** when provided with the bias such that at least one of said first portion having said red light emitting dopant material therein emits light at a wavelength in the red region and said second portion having said green light emitting dopant material therein emits light at a wavelength in the green region.” **(Emphasis Added)**

Independent claim 75 is drawn to to a device having a hole transporting layer and an electron transport layer, wherein one of the hole transporting layer and the electron transport layer has a dopant material therein that enables energy transfer and direct carrier recombination. Independent claim 75 recites, *inter alia*, a hole transporting layer and an electron transport layer wherein:

“one of said hole transporting layer and said electron transport layer includes at least one of a first portion having a red light emitting dopant material therein and a second portion having a green light emitting dopant material therein,

wherein said first electrode and said second electrode are operable to provide a bias across said hole transporting layer and said electron transport layer, and

wherein **said one of said hole transporting layer and said electron transport layer comprises a material having a spectral overlap** with said at least one of said first portion having said red light emitting dopant material therein and said second portion having said green light emitting dopant material therein, **the spectral overlap enabling energy transfer and direct carrier recombination in said one of said hole transporting layer and said electron transport layer** when provided with the bias such that at least one of said first portion emits light at a wavelength in the red region and said second portion emits light at a wavelength in the green region.” **(Emphasis Added)**

Shirasaki fails to disclose a material that enables energy transfer and direct carrier recombination and therefore fails to disclose at least the limitations discussed above in claims 68 and 75.

Page 2 of the Office action asserts that “a combination of energy transfer and direct carrier recombination” is an “inherent property of any OLED structure.” However, in an attempt to prove this assertion, the Office action states that:

“[i]n order for light emission to occur within an electroluminescent layer, electrons must be excited to a higher level (energy transfer) and then when the electrons are coming down out of the excited state (recombination) the lost [sic] of energy results in light emission.”

Shirasaki fails to disclose that the electron transport layer or the hole transporting layer have a spectral range that overlaps the spectral range of the dopant material. Therefore, Shirasaki fails to disclose one layer having spectral overlap that **enables a combination** of energy transfer and direct carrier recombination.

In light of the above, it is clear that Shirasaki fails to disclose or suggest: a host layer comprising an undoped material capable of emitting light at a wavelength in the blue region, as recited in independent claim 56; a hole transporting layer comprising an undoped material capable of emitting light at a wavelength in the blue region, as recited in independent claim 63; a host layer comprising a material that enables energy transfer and direct carrier recombination, as recited in independent claim 68; or said one of a hole transporting layer and an electron transport layer comprising a material having a spectral overlap with at least one of a first portion having a red light emitting dopant material therein and a second portion having a green light emitting dopant material therein, the spectral overlap enabling energy transfer and direct carrier recombination in the one of the hole transporting layer and the electron transport layer when provided with a bias such that at least one of the first portion emits light at a wavelength in the red region and the second portion emits light at a wavelength in the green region, as recited in independent claim 75.

Accordingly, each of independent claims 56, 63, 68 and 75 are novel over Shirasaki within the meaning of 35 U.S.C. § 102.

Further, one of ordinary skill in the art would not have been motivated to modify the disclosure of Shirasaki to arrive at claims 56, 63, 70, 75 and 83. As such, claim 56, 63, 68 and 75 are patentable over Shirasaki within the meaning of 35 U.S.C. § 103.

It would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the device of Shirasaki with the material disclosed in Noda to arrive at that which is recited in independent claim 56.

Page 7 of the Office action asserts that it “would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute BMB-2T for the universal host/HTL/ETL material because it improves the luminosity and quantum efficiency of the device (Noda; column 4, lines 34-36.” However, the first paragraph of Noda specifically discloses using three separate materials for emitting red, green and blue light – “[t]ris(8-quinolinolato) aluminum (Alq3) and bis(benzo[h]quinolin-10-olato)beryllium have been used as effective green-emitting materials. Blue-emitting materials include . . . .” Noda fails to disclose or suggest a host material having light emitting dopants therein, as disclosed in Shirasaki. Accordingly, the disclosure of Noda teaches away from the disclosure of Shirasaki. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). Because the separate materials for emitting separate light of Noda teaches away from the host material having dopants therein of Shirasaki, it is improper to combine Shirasaki and Noda.

Accordingly, one of ordinary skill in the art would not have been motivated to modify the combination of the disclosure of Shirasaki and Noda to arrive at claims 56, 63, 68 and 75. As such, claim 56, 63, 68 and 75 are patentable over the combination of Shirasaki in view of Noda within the meaning of 35 U.S.C. § 103.

As described in page 8 of the Office action, Murata is relied upon of allegedly disclosing “the use of DPP as a red pigment material and DEQ as green pigment material.” As described in page 9 of the Office action, Lin is relied upon for allegedly disclosing “a hole transporting layer comprised of 4,4-bis(1-naphthylphenylamino)biphenyl (column 8, lines 10-11).” As described in pages 9 and 10 of the Office action, Baldo is relied upon of allegedly disclosing:

“a hole blocking layer (114) comprised of bathocuproine (column 4, line 35) inserted between the light emission layer (113) and the electron transport layer (115), and wherein the hole blocking layer, hole transporting layer and electron transport layer are in electrical contact with the light emission layer.”

Without addressing the accuracy of above-discussed disclosures, it is respectfully submitted that none of Murata, Lin and Baldo discloses or suggests: a host layer comprising an undoped material capable of emitting light at a wavelength in the blue region, as recited in independent claim 56; a hole transporting layer comprising an undoped material capable of emitting light at a wavelength in the blue region, as recited in independent claim 63; a host layer comprising a material that enables energy transfer and direct carrier recombination, as recited in independent claim 68; or said one of a hole transporting layer and an electron transport layer comprising a material having a spectral overlap with at least one of a first portion having a red light emitting dopant material therein and a second portion having a green light emitting dopant material therein, the spectral overlap enabling energy transfer and direct carrier recombination in the one of the hole transporting layer and the electron transport layer when provided with a bias such that at least one of the first portion emits light at a wavelength in the red region and the second portion emits light at a wavelength in the green region, as recited in independent claim 75.

Accordingly, a combination of Shirasaki, Murata, Lin and Baldo additionally fails to disclose or suggest that which is recited in the independent claims. Further, one of ordinary skill in the art would not have been motivated to modify a combination of the disclosures of Shirasaki, Murata, Lin and Baldo to arrive at claims 56, 63, 68 and 75. As such, claim 56, 63, 68 and 75 are patentable over a combination of Shirasaki, Murata, Lin and Baldo within the meaning of 35 U.S.C. § 103.

Claims 57-62, 64-65, 67-74 and 76-81 are dependent upon claims 56, 63, 68 and 75, respectfully, and therefore include all the limitations thereof. As such, claims 57-62, 64-65, 67-74 and 76-81 are additionally patentable over the prior art of record.

Because claims 56-81 are patentable over the prior art of record, Applicants respectfully solicit an indication of allowability of claim 56-81.

If there are any outstanding issues that can be resolved by telephone interview, the examiner is asked to call the Applicants' attorney Thomas D. Robbins at 202-404-1553.

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Kindly charge any additional fees due or credit overpayment of fees to Deposit Account  
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Respectfully submitted,

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